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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,707	02/20/2004	Bryan G. Cole	M4065.0973/P973	4201
24998	7590	05/11/2006	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			SOWARD, IDA M	
2101 L Street, NW			ART UNIT	
Washington, DC 20037			PAPER NUMBER	
			2822	

DATE MAILED: 05/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/781,707

Applicant(s)

COLE ET AL.

Examiner

Ida M. Soward

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-46 and 69-82 is/are pending in the application.
- 4a) Of the above claim(s) 13-23, 38-44, 46 and 69-82 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 12, 24, 25, 29 and 45 is/are rejected.
- 7) ☒ Claim(s) 2-11, 26-28 and 30-37 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the election filed February 21, 2006.

Election/Restrictions

Applicant's election of Embodiment 1 of claims 1-12, 24-37 and 45 in the reply filed on February 21, 2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park (US 2003/0209743 A1) in view of Clevenger et al. (US 2004/0227061 A1).

In regard to claim 1, Park teaches An integrated circuit comprising: a substrate 411/412 comprising a lower layer 411 and an upper layer 412 on the lower layer 411; an array of pixel cells (unit pixel cell shown (Figure 4E) with neighboring pixels on either side (page 1, paragraph [0007])) at a surface of the upper layer 412, each pixel cell comprising a photo-conversion device (pinned photodiode, page 2, paragraph [0020]);

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and a trench structure 413 around at least a portion of the array, wherein said trench structure 413 has a top width and a base layer width and the base layer width is smaller than the top width (page 2, paragraph [0022]).

In regard to the trench structure preventing at least a portion of photons or charged particles from passing through the trench structure to the array, claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function, *In re Danly*, 263, F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

In regard to claim 12, Park teaches the integrated circuit comprising a CMOS image sensor (abstract).

However, Park fails to teach a trench structure extending from the surface to the lower layer.

Clevenger et al. teach a trench structure 116 extending from a surface to a lower layer 100A (Figures 8-12, pages 3-4, paragraphs [0048]-[0052]).

Therefore, it would have been obvious to one having ordinary skill in the art at the invention was made to modify the integrated circuit structure as taught by Park with the integrated circuit having a trench structure extending from the surface to the lower layer as taught by Clevenger et al. to improve pixel packing density (page 1, paragraph [0002]).

Claims 24, 29 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clevenger et al. (US 2004/0227061 A1) in view of Park (US 2003/0209743 A1).

In regard to claim 24, Clevenger et al. teach a structure for isolating an active area on an integrated circuit, the structure comprising: a plurality of trenches 116A/116B formed in a substrate 100A/100B of the integrated circuit on at least a portion of a periphery of the active area, wherein a depth of each of the plurality of trenches 116A/116B extends to a surface of a base layer 100B of said substrate 100A/100B and where at least one trench of the plurality of trenches 116A/116B includes a top width and a base layer width (Figures 8-12, pages 3-4, paragraphs [0048]-[0052]).

In regard to claim 45, Clevenger et al. teach an integrated circuit comprising: a substrate; an array of pixel cells 104A & 104B at a surface of the substrate 100A/100B, each pixel cell 104 comprising a photo-conversion device (page 2, paragraph [0038]); and at least one trench 116A or 116B around at least a portion of the array 104A/104B, wherein the trench 116 extends from the surface of the substrate to a depth of at least about 0.5 μ m (page 3, paragraph [0049] and page 2, paragraph [0039]) into the substrate 100A/100B and the at least one trench 116A or 116B includes a top width and a base layer width (Figures 8-12, pages 3-4, paragraphs [0048]-[0052]).

However, Clevenger et al. fail to teach the base layer width being smaller than the top width.

Park teaches the base layer width being smaller than the top width of trench 413 (Figure 4E, page 2, paragraphs [0024]-[0029]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure as taught by Clevenger et al. with the structure having the base layer width is smaller than the top width as taught by Park to increase the photosensitivity (page 1, paragraph [0009]).

In regard to claim 29, Park teaches a first fill material 423 that at least partially fills trench 413 (Figure 4E, page 2, paragraphs [0024]-[0029]).

In regard to the first fill material preventing at least a portion of photons or charged particles from passing through the trench, claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function, In re Danly, 263, F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does. Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clevenger et al. (US 2004/0227061 A1) and Park (US 2003/0209743 A1) as applied to claims 24, 29 and 45 above, and further in view of Ino (5,317,432).

Clevenger et al. and Park teach all mentioned in the rejection above.

However, Clevenger et al. and Park fail to teach an insulating liner formed along each sidewall of the plurality of trenches.

Ino teaches an insulating liner 107/114 formed along each sidewall of the plurality of trenches 105 & 112 (Figure 21, columns 11-12, lines 14-68 and 1-8, respectively).

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Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure as taught by Clevenger et al. and the structure having the base layer width is smaller than the top width as taught by Park with the structure having an insulating liner formed along each sidewall of the plurality of trenches as taught by Ino to improve the production efficiency (column 4, lines 47-50).

Allowable Subject Matter

Claims 2-11, 26-28 and 30-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to integrated circuits having trenches:

Nordstrom et al. (US 2001/0021559 A1) Voldman (US 2003/0168701 A1)

Takenaka et al. (US 2004/0188739 A1) Willer et al. (US 2003/0111687 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M. Soward whose telephone number is 571-272-

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1845. The examiner can normally be reached on Monday - Thursday 6:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra V. Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

IMS
May 10, 2006

John M. Seward
ALL 2822